Inverse Image-Based Rendering for Light Field Generation from Single Images

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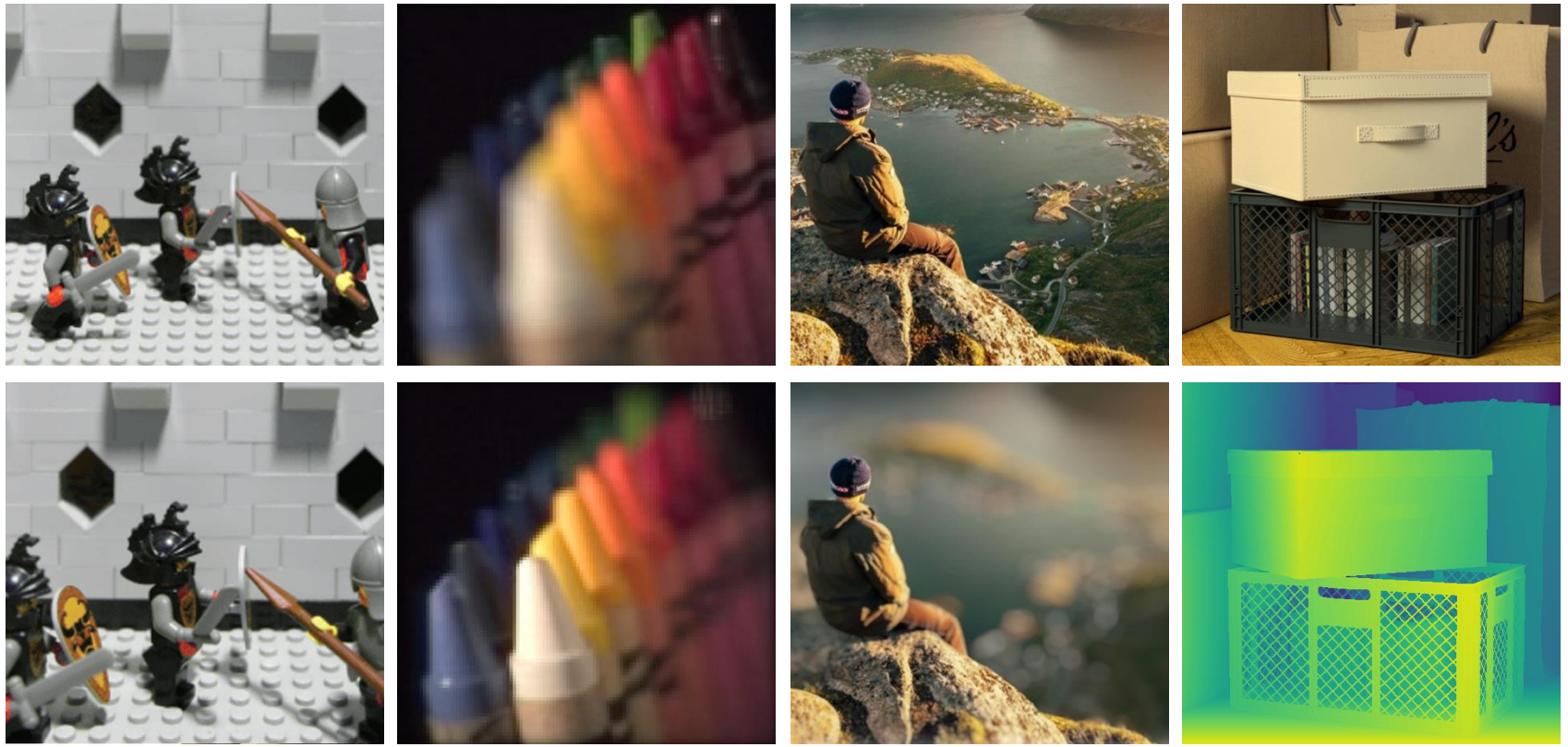
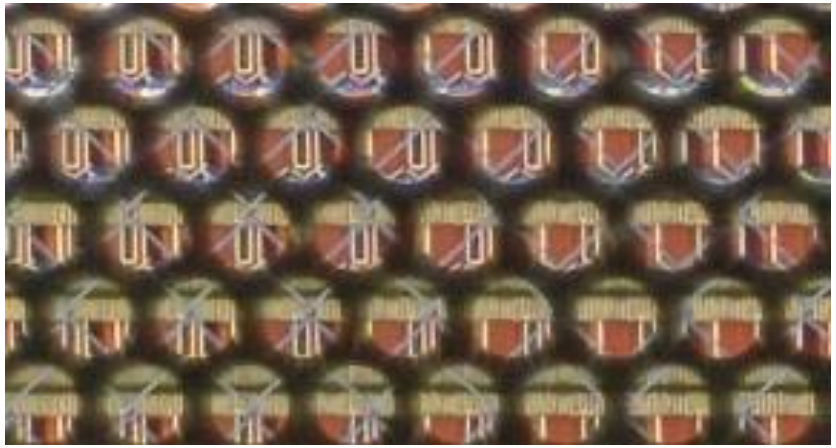


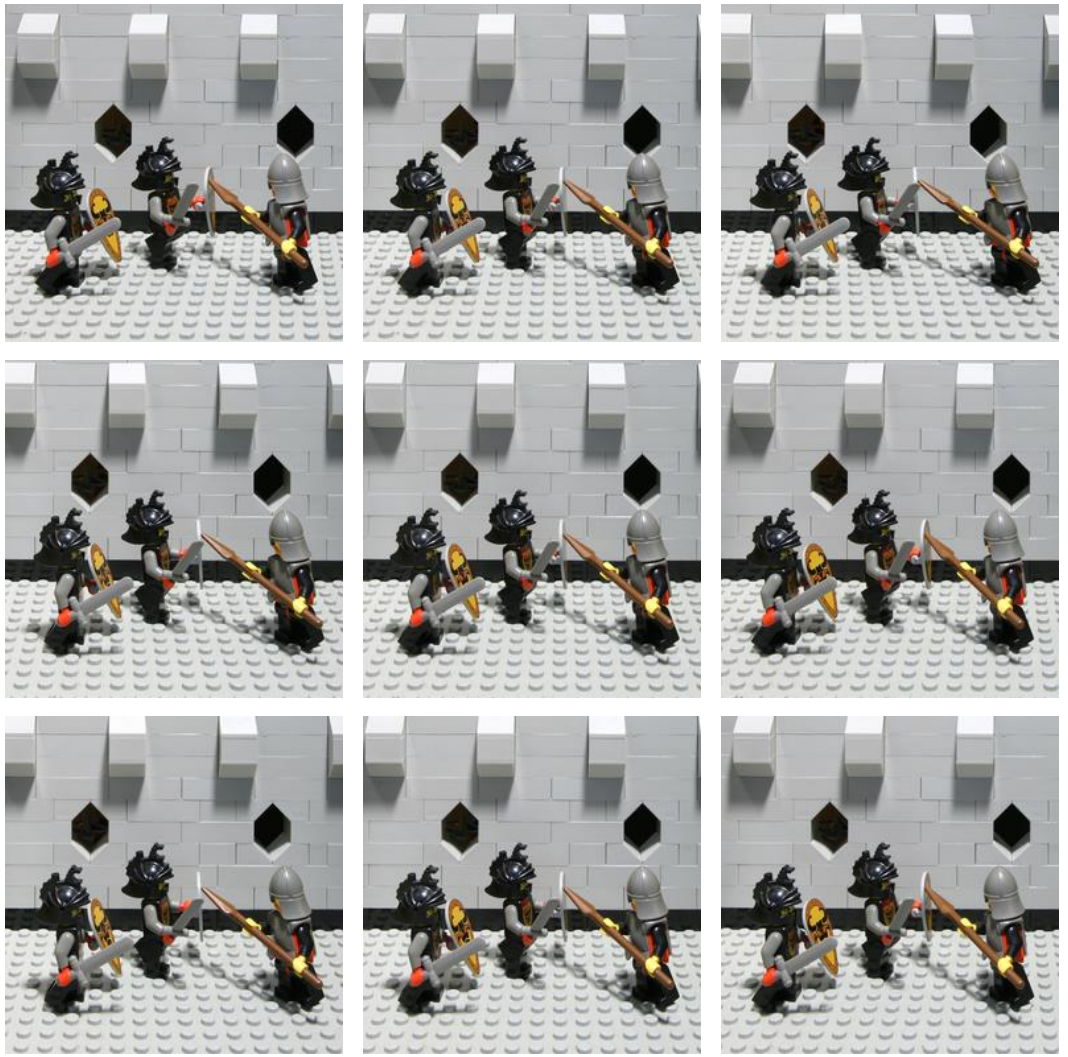
NVS Refocusing DoF Depth

The 4D light field is able to render novel views, refocused images, depth of field, and depth maps.



There are two barriers to the commercialization of light fields:
(1) Microlens arrays cannot be embedded into **compact modern devices.**
(2) Spatial–angular resolution **trade-off** due to limited sensor size.

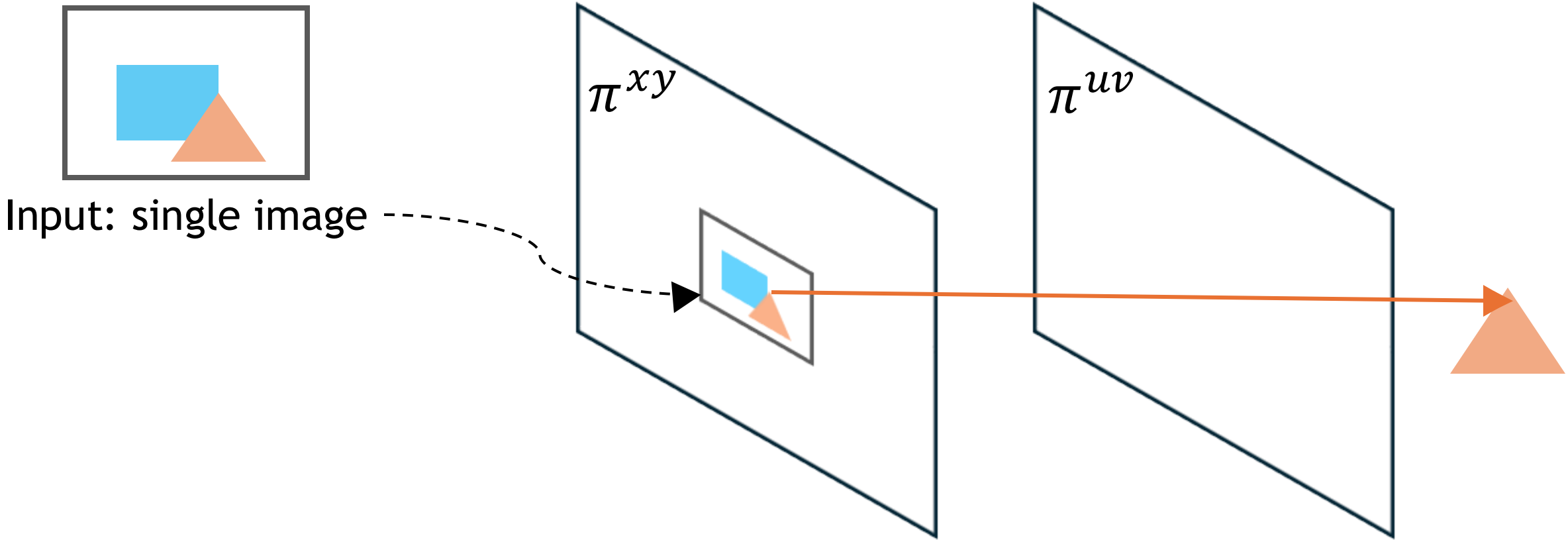
iIBR



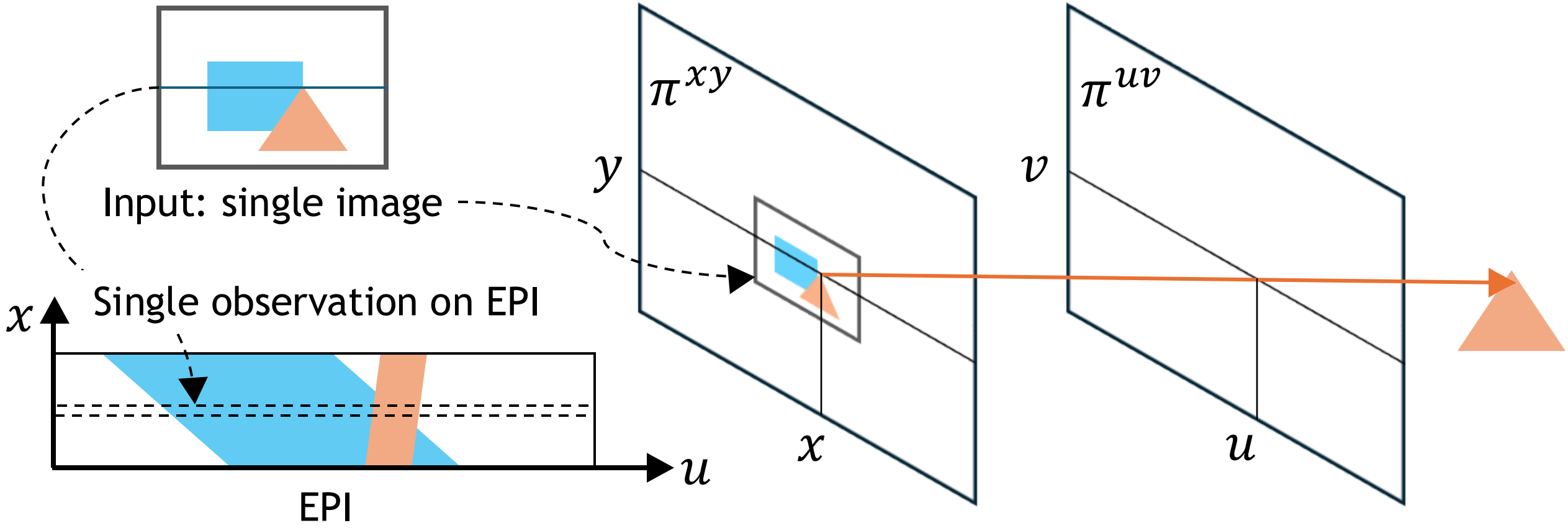
We present **i**nverse **i**mage-**b**ased **r**endering(iIBR), light field generation method from a single image.

iIBR archives multi-view consistent view generation
by leveraging a physical intuition of epipolar plane image(EPI).

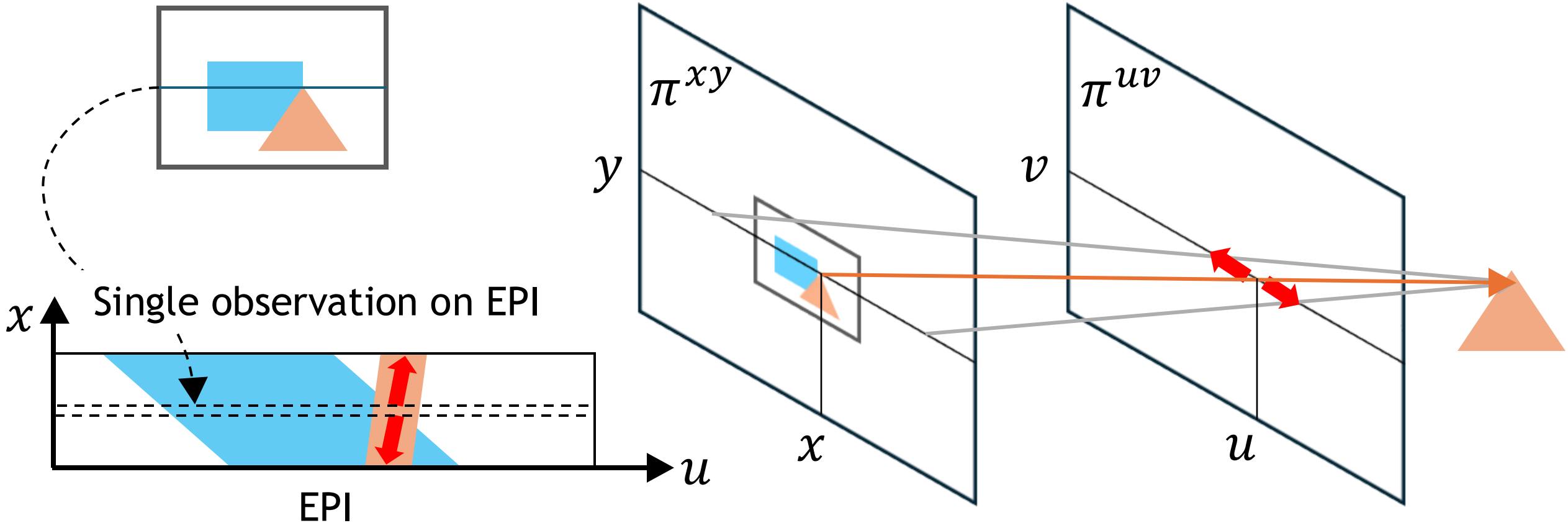
We treat an EPI as a 2D ray space and extend it into 4D.



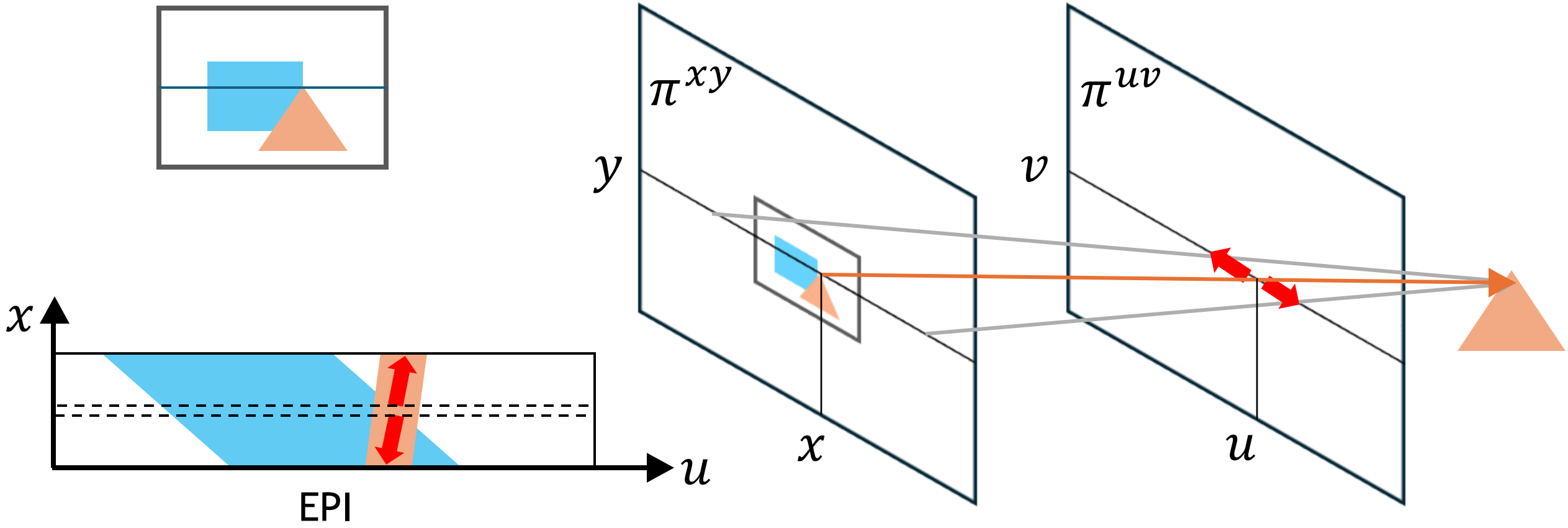
1. Every pixels in an image is light flows in space.



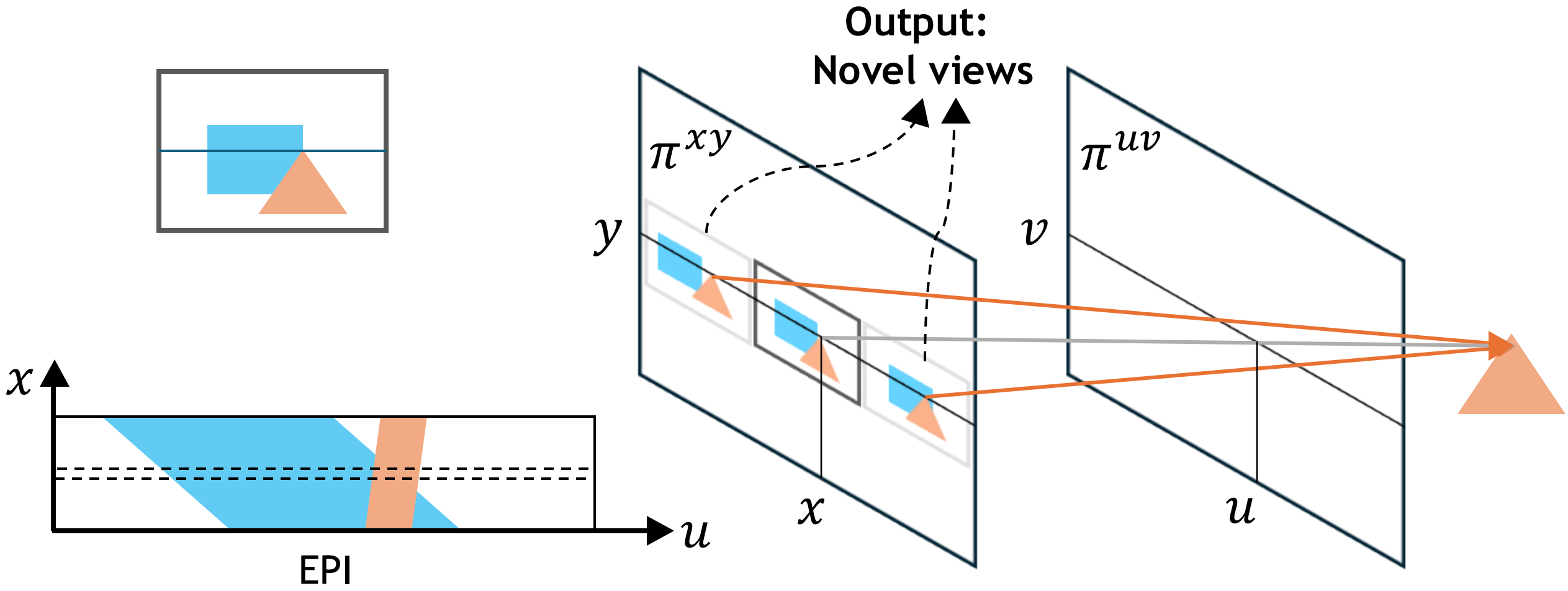
2. Each pixel can be represented as single observation on EPI.



3. Drawing EPI is equal to generate unknown rays from the corresponding known ray.



4. Novel views are generated from the synthesized rays



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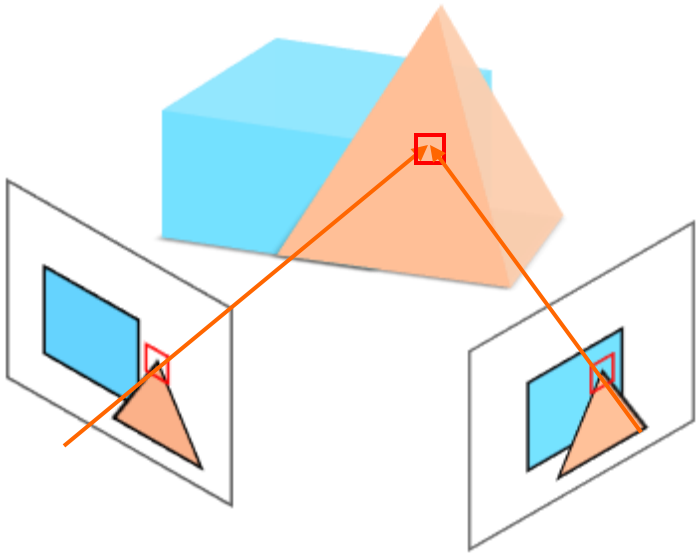
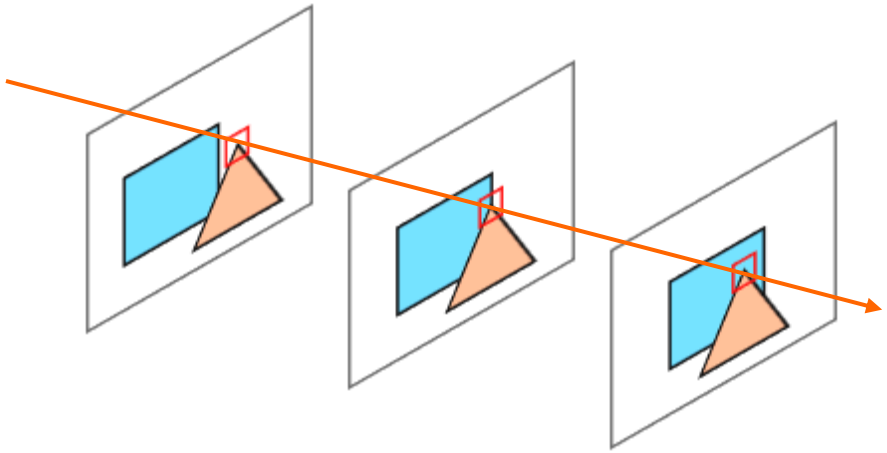


VS



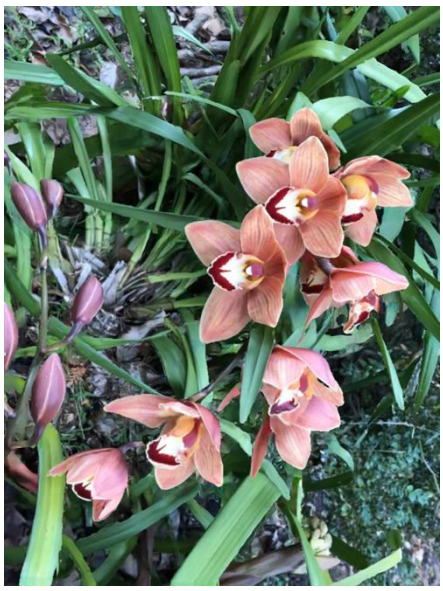
Spatial ray

Angular ray(IIBR)

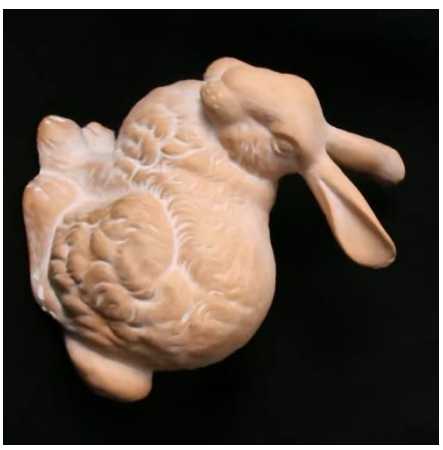
Rationale: In the spatial domain, synthesizing a novel view is a challenging ill-posed problem. However, in the angular domain, a **single ray passes through multiple correspondences**, making it a more tractable problem. EPI provides a simpler perspective on the angular domain.

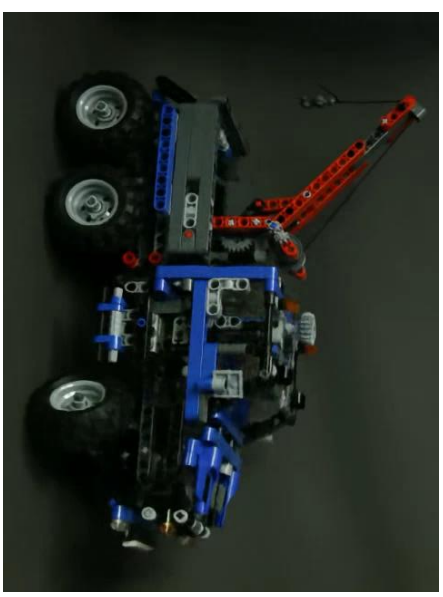
Qualitative results

NeRF LLFF dataset (ft)

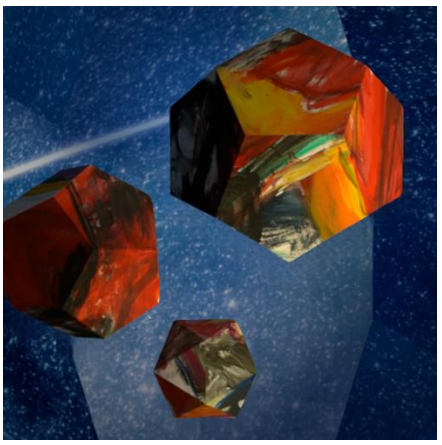


Stanford dataset (ft)





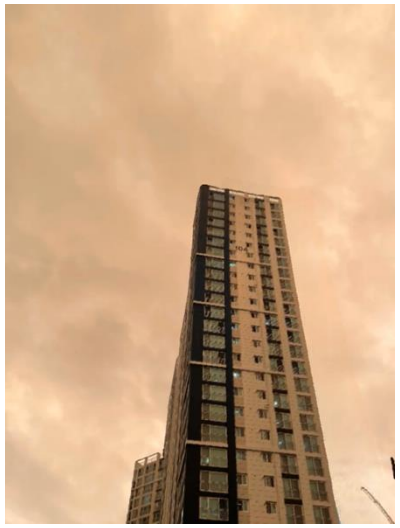
4LF dataset (ft)

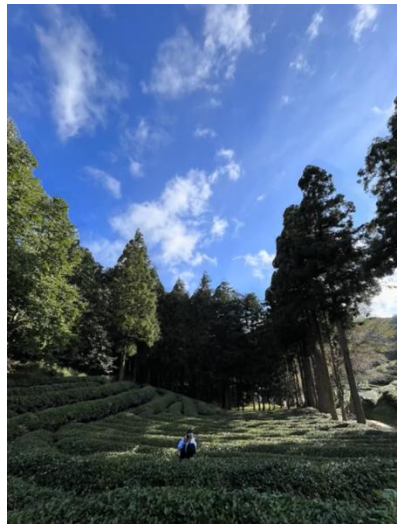
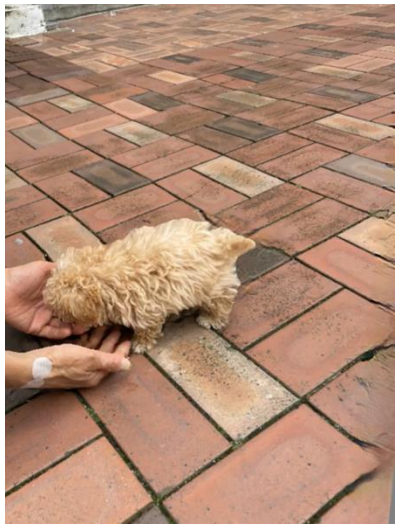


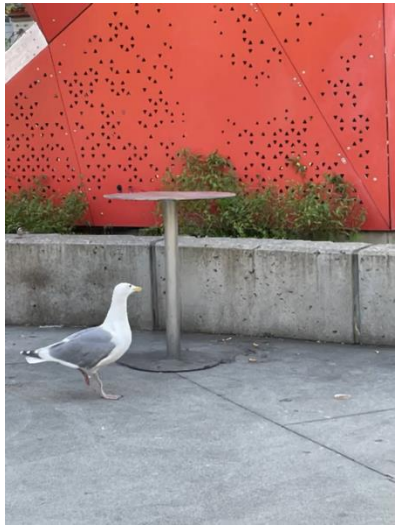
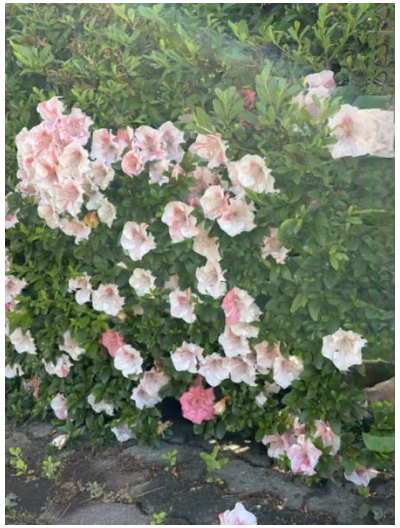
Zero-shot(trained on Pov-ray dataset) test on ImageNet dataset

Zero-shot(trained on Pov-ray dataset) test on author taken images

The images are directly captured by ourselves with Galaxy Z Flip 4



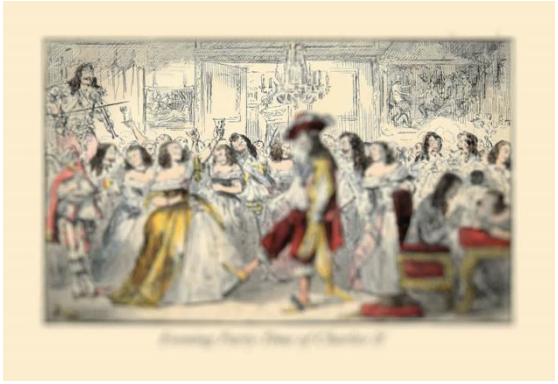
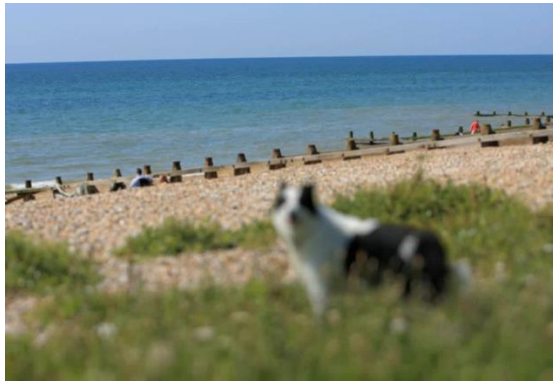



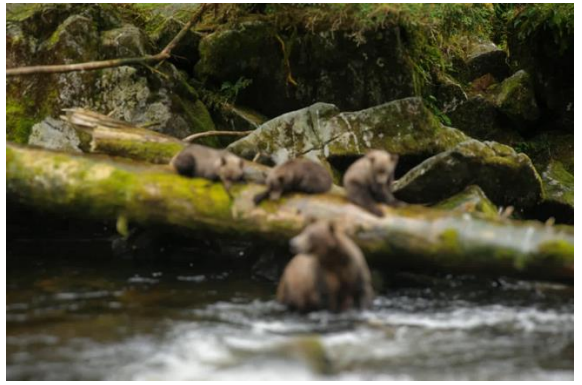



Zero-shot(trained on Pov-ray dataset) test on material edited images

Input Image | Style 1 | Style 2

Zero-shot(trained on Pov-ray dataset) digital refocusing on HQ-50k dataset



BRDF rendering after training ilBRnet

Input

Higher specularity

Metallic

Input

Higher specularity

Metallic

Stanford LF dataset

Input

Higher specularity

Metallic

Input

Higher specularity

Metallic

NeRF LLFF dataset